

PLANTS OF THE CERRADO VEGETATION OF BRASIL

R.J.A. Goodland, Departamento de Botânica,
Universidade de Brasília, Brasília, Brasil.

ABSTRACT

A list of all angiosperms collected in the 100 x 150 km. Triângulo Mineiro cerrado of Brasil is presented with ecological and phytogeographical annotations. Cerrado is a floristically fairly uniform vegetation grading from grassy scrub through 'orchard savanna', almost to forest, and occupies most of Central Brasil. The rich flora of this small area is composed of over 600 species belonging to 336 genera in 83 families. Principal families (Leguminosae, Gramineae, Compositae, Rubiaceae, Palmae, Cyperaceae), well represented families (Bignoniaceae, Vochysiaceae, Malpighiaceae, Annonaceae, Melastomataceae), and characteristic families (Caryocaraceae, Chochlospermaceae, Proteaceae, Opiliaceae) are discussed.

INTRODUCTION

Cerrado is arguably the most widespread vegetation in Brasil, yet its flora is poorly known. Due to its curious ecological conditions, its vast agricultural potential and its enormity, there is increasing interest in the cerrado (Ferri 1963, Labouriau 1966). This paper provides information on the floristic composition of the vegetation hopefully of use to future workers.

There is only one list of cerrado plants in general. This is the list of Rizzini (1963) which deals with woody plants only, from the whole extent of cerrado, compiled from several herbaria. There is another list of plants collected from a single, small, intensively worked area of cerrado compiled by Warming (1892) together with the best description to date of the vegetation. Apart from these two, there are lists of new species and early travelogs such as those of Pohl (1827-1831, 1832-1837), Warming (1867-1893), Taubert (1896), Pilger (1901), Moore (1895), Ule (1896) and Glaziou (1905) containing shorter lists from many different areas. The extensive phytogeographical studies of Sampaio (1916a,b, 1938), Hoehne (1923) and Veloso (1946, 1948a,b, 1963) provide useful lists of the more conspicuous species. Other useful sources include Mendes-Magalhaes (1955, 1962, 1964), Kuhlmann (1954, 1960), Faissol (1953), Mello-Barreto (1956), Azevedo (1959), Eiten (1963), and Hueck (1966). Finally, there are

some taxonomic works dealing with restricted taxa of mainly cerrado plants such as Fries (1905) on the Annonaceae, Malme on Bauhinia (1905a), on Vochysiaceae (1905b), on Leguminosae (1924, 1931a) and on Compositae (1931b); Stafleu on Vochysiaceae (1948, 1952, 1953) and Smith on Dyckia (1961). The illustrated series started by Ferri (1969) provides an invaluable starting place to learn the cerrado plants.

The present list was collected from a small (100 by 150 km.) but representative area of cerrado within a region called the Triângulo Mineiro. This is the western extension of the state of Minas Gerais between the Paranaíba and Grande Rivers before their confluence to become the Paraná. The 110 collection localities are located within 48° to 49°40'W. and 18°40' to 20°S. At each locality a minimum of three to four hectares were intensively worked. Only the commonest type of vegetation, cerrado, was treated; forest, sedge meadow, palm marsh, riparian and ruderal communities were omitted. Cerrado is the Brazilian name given to a floristically fairly uniform vegetational gradient ranging from grassy scrub through 'orchard savanna' almost to forest. This physiognomic gradient is arbitrarily divided into four intergrading kinds called: campo sujo (mainly herbaceous vegetation with scattered shrubs), campo cerrado (sparse 'orchard' vegetation), cerrado (dense 'orchard' vegetation) and cerradoão (almost forest). This paper applies to the studied area only, and not to the entire 150 million hectare extent of cerrado (Alvim & Araujo 1952), which occurs from north of the Amazon to south of the southern tropic.

STATISTICS

In this study (Goodland 1969), approximately 600 species of angiosperms were collected, belonging to over 300 genera in 83 families. Warming (1892) lists over 700 species belonging to 77 families in the Lagoa Santa cerrado. Rizzini (1963) lists 600 species of woody plants alone, belonging to 242 genera, from the entire cerrado area. As Brasil has one of the richest floras of the world and one of the least completely known, these figures and taxa, particularly at the species level, are approximate. The localities were visited only once, and all collections were made in the dry season. Trees are probably represented more fully than herbs, as there are fewer trees and they are more easily distinguishable from each other.

Some taxa are 'lumped'. This applies particularly to the families Myrtaceae, Palmae, Cyperaceae, Gramineae, and to the genera Ouratea, Alibertia, Cassia, Mimosa, Centrosema, Eriosema, Stylosanthes and possibly others. The entire collection was compared with material in the

Table 1. The Principal Families and Genera in the Triângulo Mineiro Cerrado.

Principal Families (Total: 83)	Number of Genera (Total: 336)	Number of Species (Total: 600)
Leguminosae	44	107
Caesalpinioidae	(8)	(30)
Mimosoidae	(5)	(12)
Papilionoidae	(25)	(52)
Indeterminata	(6)	(13)
Gramineae	31	73
Compositae	36	69
Rubiaceae	17	30
Palmae	13	22
Cyperaceae	8	24
Bignoniaceae	7	22
Vochysiaceae	3	16
Apocynaceae	7	15
Euphorbiaceae	10	14
Malpighiaceae	8	14
Labiatae	5	13
Melastomataceae	7	11
Annonaceae	5	11

Principal Genera	Number of Species
Cassia	16
Vernonia	14
Paspalum	11
Vochysia	11
Tabebuia	10
Hyptis	9
Eriosema	9
Panicum	9
Annona	7
Aspidosperma	7
Bulbostylis	6
Bauhinia	6
Axonopus	6
Jacaranda	6
Rhynchospora	5
Erythroxylum	5
Andropogon	5
Borreria	5
Psidium	5
Byrsonima	5
Baccharis	5

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PRINCIPAL FAMILIES

The families best represented in this flora are listed in Table 1. There are 16 families with 5 or more genera and with more than 10 species. These fall into two groups. Eleven of these families are large on the world scale, and are similarly large in the cerrado. The remaining five families are not large by world standards and so are 'over represented' in the cerrado and are thereby more characteristic of it. These are the Bignoniaceae, Vochysiaceae, Malpighiaceae, Annonaceae and Melastomataceae.

The Bignoniaceae is large due to the neotropical tree genera Tabebuia (including Tecoma) and Jacaranda. The Vochysiaceae is perhaps the most characteristic family of cerrado vegetation. It is essentially a small, neotropical family of 6 genera. Salvertia never occurs away from the cerrado, while the genera Vochysia, Qualea, and Callisthene occur mainly in cerrado but also in adjacent forests. Qualea grandiflora and Q. parviflora are the dominant trees in most of the sites visited.

Similarly the Malpighiaceae is mainly a small neotropical family, well represented in the cerrado. The genus Byrsonima is an important component of cerrado vegetation, occurring in every locality and dominating some. Byrsonima provides three species among the twenty most important trees.

The Annonaceae is a small tropical family mainly of forest stragglers in the palaeotropics, but of small trees in savannas and cerrado in the neotropics.

The four largest terrestrial families in the world are also the best represented in this study, i.e. Leguminosae, Compositae, Gramineae, and Rubiaceae. Nearly all the families in Table 1 are also among the largest in the world and so do not indicate much about the flora, but are important in cerrado.

The Leguminosae is important in the vegetation as well as in the flora. The fourth most abundant tree

is a legume, Bowdichia, as are the abundant trees Sweetia (2 spp.), Machaerium (4 spp.), Stryphnodendron (2 spp.), Dimorphandra and Dalbergia. Pterodon, Andira, Hymenaea, Vatairea, Plathymenia, Sclerolobium and Copaifera are also fairly common cerrado trees. Many genera of small shrublets or herbs which do not contribute greatly to the vegetation are also legumes such as Eriosema, Centrosema, Desmodium, Clitoria, Phaseolus, Indigofera, Crotalaria, Galactia, Stylosanthes, Rhynchosia, Zornia, Mimosa, Bauhinia and Cassia. The last three genera have many cerrado species each but only the pantropical Bauhinia is at all abundant in the vegetation. Several cerrado legumes are being evaluated agriculturally for nitrogen fixing ability, and the family as a whole may be of great significance in the nitrogen balance of the senile cerrado soils. The Leguminosae is perhaps the second most important family in the vegetation, mainly in the tree layer.

The Compositae is the second or third largest family in cerrado, but is possibly more important in the vegetation than its rival the Gramineae. The second largest cerrado genus, Vernonia, is the largest genus of angiosperms in Brasil, although pantropical in distribution with over 1000 species. At least 14 species occur in cerrado with a great variety of habit. V.ferruginea occurs in more than half the sites, mainly in campo sujo and is a small tree; few are small herbaceous perennials. Most Vernonia species are robust woody herbs or subshrubs up to 1 m. in height and rough in texture, e.g. V.bardanoides and V.herbacea. Some are delicate, sub-autotomous and broom-like above ground with large woody organs beneath, e.g. V.brevifolia, V.grandiflora. This xero-, oligotrophico- or pyromorphic lifeform is characteristic of the cerrado, giving rise to 'subterranean trees' (Rizzini & Heringer 1961, 1962, Rizzini 1965a,b, Rachid 1947, Rachid-Edwards 1956), xylopodia, cormophytes etc. (vide Malme 1940). This genus is often associated with grassy places and is characteristic of the cerrado; V.ruficoma, V.elegans, V.bardanoides being the most common.

The genus Baccharis is similar to Vernonia in several ways. Most of the 400 species of Baccharis are restricted to neotropical savannas and are characteristic of cerrado. They are mainly herbs with woody bases or rootstocks, but some are woody shrubs, e.g. B.dracunculifolia. Some Baccharis species are leafless xeromorphs with a flanged or broom-like stem, e.g. B.gracilis. B.humilis is common in cerrado but at a low level of abundance.

The 1200 species of Eupatorium are largely neotropical. The three cerrado species are woody herbs or shrubs, and do not contribute much to the vegetation. The 2000-3000 cosmopolitan species of Senecio make it the world's largest genus, but it is not important in cerrado. Senecio brasiliensis is an occasional woody herb or shrub attaining 1 m. in some areas of cerrado.

The dominant composite is the very common tree Piptocarpha rotundifolia. This occasionally dominates the vegetation and actually achieves the maximum "Importance Value" (Curtis and Cottam 1962) of any tree in the cerrado. It is the ninth most important tree and occurs in two thirds of the sites. Apart from Vernonia ferruginea, there are two other uncommon cerrado composite tree genera: Vanillosmopsis erythropappa, and Eremanthus glomerata. These are both small genera restricted to Brasil and very characteristic of cerrado but not abundant in it. The other two Eremanthus species, E. glomerulata and E. sphaerocephala are conspicuous but uncommon subshrubs.

The huge family Rubiaceae has only 17 genera in this cerrado and is the fourth largest. The pantropical genus Borreria is the largest genus of cerrado Rubiaceae and occurs as small erect herbs often woody at the base. The genus Alibertia has at least three cerrado species and is more abundant than Borreria. Alibertia is a small neotropical genus varying from almost acaulescent suffrutices to large shrubs. The genus is fairly abundant in cerrado vegetation, mainly in campo sujo. Psychotria and Rudgia are the only common rubiaceous trees, but neither is abundant, and both are restricted to cerrado. All the remaining rubiaceous genera are occasional herbs, except for the uncommon cerrado trees Guettarda, Genipa and Tocoyena.

No family characterises the tropics better than the Palmae. Palms are immediately recognizable to family but further identification is difficult, particularly as nearly all the cerrado palms belong to the same subfamily, the Coccoideae (Corner 1966). Apart from tropical sandy beaches, the area best characterised by palms is adjacent to the cerrado in the dry North-Eastern part of Brasil where Orbignya (Babaçu) and Copernicia (Carnaúba wax palm) cover vast areas. These also enter parts of the cerrado. Within areas of cerrado, nearly every watercourse and lake is surrounded by Mauritia vinifera (Buriti) but this is never a component of cerrado vegetation. A few palms occur

as rare trees in cerrado, e.g. Acrocomia sclerocarpa, but most are short acaulescent xeromorphs of campo sujo -campo cerrado. Acanthococos and Attalaea are the most common, followed by Syagrus, Butia and Allaoptera (= Diplothemium). These are mainly small, well localized, neotropical plants, each forming coarse, spiny tufts, 50-150 cm. high, occasionally becoming abundant.

Although cerrado appears to be a dry rather than a wet type of vegetation, the family Cyperaceae is a conspicuous element. The graminoid habit in general is xeromorphic; doubtless creeping rhizomes, cespitoseness and the perennial habit contribute to the abundance of this family in cerrado. In general, their root systems are poorly developed. Most of the 6-8 cerrado sedge genera have a few hundred neotropical species. These genera are common in many neotropical savannas and on occasion dominate the grasses. Sedges are much more abundant in campo sujo -campo cerrado than in cerrado.

The large family Melastomataceae is well represented in Brasil and in cerrado. The essentially neotropical genus Miconia is by far the most abundant melastome. Rizzini (1963) lists 11 species, but only one is common in the Triangle. Miconia argentea is a common cerrado tree, occasionally becoming abundant in cerrado and is even the dominant tree in one site. It is absent from campo sujo.

THE GRASSES

The cerrado gradient as a whole cannot be considered grassland. However, grasses are fairly prominent in most kinds of cerrado, except cerrado, thus the Gramineae is the largest herbaceous family in this vegetation. There are only six genera in cerrado with more than a couple of species. The largest genus, Paspalum, is fairly characteristic of neotropical grasslands, although it is pantropical. The other large cerrado genera: Panicum, Andropogon, Aristida and Eragrostis, are large and widespread genera in the world flora. Only Axonopus of the large cerrado genera is typical of neotropical grassland.

There are four small cerrado genera restricted to the neotropics: Gymnopogon, Echinolaena, Thrasya and Leptocoryphium. This last genus is monotypic, L. lanatum occurring in natural grasslands mainly from Venezuela and the West Indies to Brasil, but is not abundant in cerrado. Gymnopogon and Thrasya are widespread in cerrado, but at a low level of abundance. Echinolaena inflexa is the most

widespread and abundant grass in this cerrado and is more or less restricted to it. It is a small genus of five species in Central and South America and one in Madagascar. Although E.inflexa is so abundant, it is a small but conspicuous grass, rarely exceeding 50 cm. in height and is rarely caespitose.

There are two small genera occurring in both the American and the African tropics: Trachypogon and Tristachya. Both these genera are widespread in cerrado vegetation with Trachypogon fairly abundant and Tristachya very abundant. They are both tall, conspicuous grasses, Tristachya leiostachya is the tallest cerrado grass, sometimes exceeding three meters in height and becoming woody at the base. T.chrysothrix is more abundant than T.leiostachya, but not as tall. They are both characteristic species of the cerrado. Trachypogon is not as important in the cerrado as it is in the Llanos of Colombia (Blydenstein 1967) and Venezuela (Lasser 1955, Blydenstein 1962), and in the savannas of the Guianas (Donselaar 1968, Heyligers 1963, Goodland 1965, 1966, Beard 1953) where Trachypogon, often T.plumosus, is frequently the main component of the sward. In the Triangle, T.mollis occurred, but T.plumosus, T.vestitus and T.canescens are common in other cerrado areas.

There are only five other cerrado grass genera of any importance; these are the large genera of tropical and warm temperate grasslands: Chloris, Setaria, Melinis, Hyparrhenia and Rhynchelytrum. They are frequently used as pasture grasses in warm countries and the last two were introduced to the neotropics. Rhynchelytrum is more a ruderal and is common on roadsides. Hyparrhenia rufa (Jaraguá grass) is tall and so woody that it must be fired annually to provide pasture. Melinis minutiflora (Molasses grass) is, however, sensitive to fire, hence is more abundant in cerrado than in campo sujo. It is mainly an African genus and it is not certain whether M.minutiflora is native to the neotropics or naturalized. It is encouraged in cerrado and provides good grazing, but it is unpleasantly sticky to walk through when dense. The genera Chloris and Setaria are fairly common.

Only in campo sujo are the grasses more prominent than the trees. But even then, grass does not obscure all the woody components. The flowering culms of Tristachya leiostachya, Hyparrhenia rufa, and Axonopus pressus are occasionally taller than the observer. Several grasses reach 1 m. in height but as single plants rather than as tufts or dense stands. Most grasses in this area are less

than 50 cm. in height. The caespitose habit is not common and grasses rarely form a dense sward in the cerrado. Thus, though grasses are common and occasionally conspicuous, they are rarely dominant in the vegetation as a whole.

MINOR FAMILIES

Almost one third of the 83 families occur in this area of cerrado with only one genus and often only one species. These 24 families fall into three almost equal groups. Ten are mainly from forest, but occur as rare species in cerrado. Seven families are so occasional that not much about the cerrado can be learned from them, and the remaining seven are mainly monotypic and either endemic or very characteristic of the cerrado. The ten rare families of cerrado with their genera are Aquifoliaceae (Ilex), Araliaceae (Schefflera), Icacinaceae (Emmotum), Myristicaceae (Virola), Polygonaceae (Coccoloba), Symplocaceae (Symplocos), Tiliaceae (Luehea), Balanophoraceae (Langsdorffia), Commelinaceae (Commelina) and Marantaceae (Maranta). They are mainly medium sized tropical families having one rare species in the cerrado. The first seven are trees the last two are herbs.

Schefflera (= Didymopanax) is the most important tree in this group. Ilex, Schefflera, Coccoloba, and Luehea are more abundant in seasonal forest. Emmotum occurs mainly in seasonal and riparian forests, and Virola in Amazonian forests. Symplocos and Luehea are more abundant in other cerrado areas than the Triangle. Langsdorffia is a curious tree-root parasite only found in cerrado. Commelina and Maranta are allegedly aquatic plants or plants associated with wet places. Even in cerrado they are rare, but their presence suggests that cerrado may be moister than other cerrado types.

The seven 'occasional' families are mainly herbaceous and are not restricted to the tropics. They are: Aristolochiaceae (Aristolochia), Cucurbitaceae (Cayaponia), Loranthaceae (Phoradendron), Scrophulariaceae (Buchnera), Solanaceae (Solanum), Umbelliferae (Erynqium) and Caryophyllaceae (Polycarpea). The most important member of this group is the common but not abundant Solanum lycocarpum. This tree is partly ruderal and occurs mainly in campo sujo. Aristolochia and Cayaponia are vines or trailers, a life form uncommon in cerrado. Both have enormous woody underground organs. Buchnera and Phoradendron respectively are occasional terrestrial and epiphytic semi-parasites. Buchnera is principally palaeotropical in distribution. Umbelliferae and

Caryophyllaceae are temperate families, poorly represented in Brasil. Eryngium is a prickly herb. Polycarpaea is a tiny ephemeral occurring in many savannas from Mexico through Brasil.

CHARACTERISTIC FAMILIES

The mainly monotypic, characteristic or endemic families with their cerrado genera are: Caryocaraceae (Caryocar), Cochlospermaceae (Cochlospermum), Ebenaceae (Diospyros), Cuttiferæ (Kielmeyera), Malvaceae (Sida), Proteaceae (Roupala) and Opiliaceae (Agonandra). These are mainly small tropical families providing one important cerrado genus each. They are all trees except Sida which is a ruderal herb of warm countries, especially America, common in neotropical savannas. The genus Cochlospermum is always woody, but in the cerrado it is usually a somewhat fleshy sub-shrub. It is very characteristic of cerrado but some species occur as trees in neotropical seasonal forests. Agonandra is a rare tree in this area and may be more common in some other type of vegetation. Its family, Opiliaceae, occurs in tropical Asia as small trees, parasitic on roots, with just the one small genus in Brasil.

Species of the remaining four families are important tree components of cerrado vegetation. Caryocar is a small neotropical tree genus with delicious drupes. One species, C.brasiliense, is the fifth most abundant tree in this cerrado. It occurs in more than two thirds of the sites, and is the leading dominant in five of them, becoming more abundant in cerradoão.

The next most important tree in this series is Diospyros hispida, which is almost as important in the vegetation as Caryocar. Diospyros is the eleventh most abundant tree, occurring in more than two thirds of the sites, and dominating four. It is a fairly small, but wide ranging tree becoming more abundant in campo sujo. Although the family Ebenaceae is mainly tropical, the genus Diospyros is widespread in many warm countries.

Kielmeyera is one of the most characteristic genera of the cerrado. It is a small genus of about 20 species largely restricted to the cerrado of Brasil. Rizzini (1963) lists four woody species from his area. Only one is at all important in the Triangle, K.coriacea, occurring in nearly three quarters of the localities. This gracile tree is occasionally the leading dominant, is very widespread and is in the top twenty important trees.

One other smaller species, K.rosea, is occasionally present.

Finally in this series is the morphologically variable tree genus Roupala. Appropriately belonging to the Proteaceae, this tree has entire or serrate, simple or compound leaves on the same plant or on different plants of the same species. Roupala occurs in half the sites but more in cerradão. The Proteaceae as a whole is xeromorphic and characteristic of areas with a long dry season. Roupala has coriaceous, waxy leaves; some have a puberulent indumentum.

ENDEMISM

It is not particularly meaningful to discuss endemism with respect to such a poorly investigated flora, but some comment can be made on 'characteristic' taxa. Brasil is considered rich in Compositae, Orchidaceae, Euphorbiaceae, Leguminosae, Asclepiadaceae, Bignoniaceae, and Melastomataceae. The Orchidaceae occurs mainly as epiphytes on forest trees and so is not well represented. All the others are well represented in cerrado.

The following taxa are endemic to the Brazilian region and occur in the Triangle cerrado: Eremanthus, Hoehnephytum, Kielmeyera, Antonia, Barjonia, Nautonia, Ananas, Hancornia, Magonia, Riedeliella, Diptychandra and Torresea. Barjonia and Nautonia are occasional asclepiads of the campo sujo-campo cerrado. The cultivated pineapple is a variety of Ananas comosus which occurs naturally in the region. Another terrestrial bromeliad, Dyckia, has most species in an adjacent area of cerrado (Smith 1961). Hancornia speciosa and Magonia pubescens are occasional trees of cerrado-cerradão. The genus Manihot has speciated copiously in cerrado although it is not abundant. Characteristic of Brasil, but not restricted to it is the genus Jacaranda, represented by perhaps six species in cerrado. Most are rare cerradão trees but others live mainly underground with a few sprouts above, on occasion becoming abundant in campo sujo. The small, rare leguminous tree genera Riedeliella, Diptychandra and Torresea provide one species each in cerradão but are poorly known.

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LIST OF THE CERRADO PLANTS OF THE TRIÂNGULO MINEIRO

ACANTHACEAE

- Justicia sp.
Ruellia geminiflora

AMARANTHACEAE

- Alternanthera sp.
Cnophrena graminea
 officinalis
 virgata
Iresine sp.
Pfaffia jubata
 sericea

ANACARDIACEAE

- Anacardium humile
 nanum
Anacardium sp.
Astronium fraxinifolium
 urundeuva
Lithraea eroeirinha
Tapirira guianensis

ANNONACEAE

- Annona campestris
 coriacea
 crassiflora
 monticola
 pygmaea
 tomentosa
Annona sp.
Cardiopetalum calophyllum
Duguetia furfuracea
Guatteria silvicola
Xylopia grandiflora

APOCYNACEAE

- Aspidosperma camporum
 dasycarpon
 macrocarpon
 tomentosum
Aspidosperma spp.3
Hancornia speciosa
Himatanthus articulatus
Macrosiphonia longiflora
 velame
Mandevilla illustris
Odontadenia spp.
Rhodocalyx rotundifolium

AQUIFOLIACEAE

- Ilex sp.

ARALIACEAE

- Schefflera (=Didymopanax)
 macrocarpum

ARISTOLOCHACEAE

- Aristolochia goleata

ASCLEPIADACEAE

- Barjonia obtusifolia
Ditassa sp.
Nautonia nummularia

BALANOPHORACEAE

- Langsdorffia hypogaea

BIGNONIACEAE

- Anemopaegma arvense

Arrabidaea brachypoda
 platyphylla
 Cybistax antisiphilitica
 Jacaranda acutifolia
 brasiliiana
 caroba
 decurrens

Jacaranda spp.

Memora nodosa

Tabebuia avellandaeae
 caraiba
 leucoxylon
 longiflora
 ochracea
 odontodiscus
 umbellata

Tabebuia spp.3

Zeyhera montana

BOMBACACEAE

Bombax cyathophorum
 tomentosum

Eriotheca gracilipes

Eriotheca sp.

BORAGINACEAE

Cordia axillaris

Tournefortia elegans

BROMELIACEAE

Bromeliaceae sp.

Ananas comosus

Bromelia sp.

Dyckia spp.

Nidularium sp.

BURSERACEAE

Bursera sp.

Protium heptophyllum

Protium sp.

CACTACEAE

Phyllocactus acuminatus

Rhipsalis spp.

CARYOCARACEAE

Caryocar brasiliense

CARYOPHYLLACEAE

Polycarpaea corymbosa

CELASTRACEAE

Maytenus alaternoides

Maytenus sp.

Plenckia populnea

Salacia cemepestris

CHRYSOBALANACEAE

Couepia grandiflora

Hirtella sp.

Licania humilis

Licania sp.

Parinari obtusifolia

COCHLOSPERMACEAE

Cochlospermum regium

COMBRETACEAE

Combretaceae sp.

Combretum sp.

Terminalia argentea

COMMELINACEAE

Commelina sp.

COMPOSITAE

Compositae spp.14

Achyrocline sp.

Agaratum conyzoides

Aspilina elliptica

 foliacea

Aspilina sp.

Aster camporum

Raccharis desertorum

 dracunculifolia

 gracilis

 humilis

Baccharis sp.

Bidens pilosa

Calea cuneifolia

 platylepis

Chaptalia integrifolia

Oasyphyllum sp.

Dimerostemma sp.

Eupatorium amygdalinum

 harminoides

 maximiliana

Elephantopus mollis

Eremanthus glomeratus

 glomerulatus

 sphaerocephalus

Hoehnephytum trixoides
Hoehnephytum sp.
Ichthyothere agrestis
 terminalia
Isostima paucedanifolium
Kanina implexa
Mikania hirsutissima
Piptocarpa rotundifolia
Porophyllum ruderale
Pterocaulon sp.
Riencourtia oblongifolia
Spilanthes arnicoides
Trichocline sp.
Trixis glutinosa
Vanillosmopsis erythropappa
Vernonia barbata
 bardanoides
 brevifolia
 elegans
 ferruginea
 grandifolia
 herbacea
 holosericeus
 lingulata
 onopocroides
 polyanthes
 ruficoma
Vernonia sp.
Viguiera hassleriana
Wedelia puberula

CONNARACEAE

Connaraceae sp.
Connarus fulvus
 suberosus
Rourea induta

CONVOLVULACEAE

Evolvulus pterocaulon
Evolvulus sp.
Ipomoea sp.
Jacquemontia sp.

CUCURBITACEAE

Cayaponia espelina

CYPERACEAE

Cyperaceae spp.3
Bulbostylis capillacea
 spadicea

Bulbostylis spp.4
Cyperus diffusus
 flavus
Dichromena ciliata
Fimbristylis diphylla
 junciformis
Fimbristylis spp.
Rhynchospora cyperioides
 tenuis
Rhynchospora spp.3
Scleria geniculata
Scleria spp.

DILLENIACEAE

Curatella americana
Davilla elliptica

EBENACEAE

Diospyros hispida

ERYTHROXYLACEAE

Erythroxylum campestre
 deciduum
 suberosum
 testaceum
 tortuosum

EUPHORBIACEAE

Bernardia sp.
Croton antisiphilitica
Croton sp.
Dalechampia humilis
Euphorbia setosa
Julocroton sp.
Manihot gracilis
Manihot spp.3
Maprounea brasiliensis
Phyllanthus niruri
Phyllanthus sp.
Sebastiania corniculata

FLACOURTIACEAE

Casearia sylvestris
Casearia sp.
Xylosma sp.

GENTIANACEAE

Calolisianthus speciosus
Dejanira erubescens
 nervosa

Dejanira pallescens

GRAMINEAE

Gramineae spp.7

Andropogon bicornis
condensatus
lateralis
selloanus

Andropogon sp.

Aristida adscencionis
capillacea
implexa
megapotamica

Aristida pallens

Aristida sp.

Axonopus capillaris
pressus

Axonopus spp.4

Chloris polydactyla

Ctenium sp.

Diectomis fastigiata

Echinolaena inflexa

Elionurus sp.

Eragrostis maypurensis

Eragrostis spp.3

Gymnopogon foliosus
spicatus

Hackelochloa sp.

Hyparrhenia rufa

Ichnanthus sp.

Lasiacis sp.

Leptocoryphium lanatum

Melinis minutiflora

Mesosetum sp.

Olyra latifolia

Oplismenus hirtellus

Panicum campestre
cervicatum

Panicum spp.7

Paspalum carinatum
plicatulum
pulchellum
stellatum

Paspalum spp.7

Pennisetum setosum

Rhynchelytrum roseum

Setaria geniculata

Setaria sp.

Sporobolus cubense

Thrasya paspaloides

Trachypogon mollis

Tristachya chrysotrich
leiostachya

GUTTIFERAE

Kielmeyera coriacea
rosea

ICACINACEAE

Emmotum nitens

IRIDACEAE

Cipura sp.

Sisyrinchium vaginatum

Trimezia juncifolia

LABIATAE

Labiatae sp.4

Eriope crassipes

Clechoma sp.

Hyptis cana
coccinea
crinita

glauc
nudicaulis

virgata

Hyptis spp.3

Peltodon sp.

LAURACEAE

Cassytha americana

Nectandra sp.

Ocotea sp.

LEGUMINOSAE

Leguminosae spp.13

CAESALPINIOIDEAE

Bauhinia burchellii
bongardii
tenella
rufa

Bauhinia spp.

Dimorphandra mollis

Diptychandra glabra

Cassia basifolia

cathartica

cotinifolia

cultrifolia

Cassia flexuosa
langsдорffia
patellaria
pilifera
rotundifolia
rugosa

Cassia spp.6
Copaifera langsдорffii
Enterolobium ellipticum
Hymenaea stigonocarpa
stilbocarpa
Hymenaea sp.
Sclerolobium aureum
Sclerolobium sp.

MIMOSOIDEAE

Inga sp.
Mimosa laticifera
platyphylla
Mimosa spp.3
Piptadenia falcata
macrocarpa
perigrina
Plathymeria reticulata
Stryphnodendron adstringens
obovatum

PAPILIONOIDEAE

Aeschynomene paucifolia
Andira humilis
narum
paniculata
Andira sp.
Bowdichia virgiloides
Centrosema sp.
Clitoria guyanensis
Clitoria sp.
Crotalaria anagyroides
retusa
Crotalaria sp.
Dalbergia violacea
Desmodium canum
Desmodium sp.
Dipteryx alata
Eriosema crinitum
Eriosema spp.8
Erythrina spp.
Galactia spp.

Harpalyce brasiliana
Indigofera gracilis
Machaerium aculeatum
acutifolium
lanatum
opacum

Ormosia sp.
Periandra mediterranea
Phaseolus filinus
Platypodium elegans
Pterodon pubescens
Rhynchosia sp.
Riadeliella graciliflora
Stylosanthes guyanensis
montevidensis
viscosa
Sweetia dasycarpa
pseudoelegans
Torresea cearensis
Vatairea macrocarpa
Zornia diphylla
latifolia
reticulata

LILIACEAE

Hereria sp.
Smilax spp.

LOGANIACEAE

Antonia ovata
Antonia sp.
Strychnos pseudoquina
Strychnos sp.

LORANTHACEAE

Phoradendron sp.

LYTHRACEAE

Cuphea linarioides
Lafoensia densiflora
pacari

MALPIGHIACEAE

Banisteria intermedia
Banisteria sp.
Banisteriopsis sp.
Byrsonima basiloba
coccolobifolia

Byrsonima crassifolia
intermedia
verbascifolia

Camarea affinis
Heteropteris affinis
Peixotoa hirta
Peixotoa sp.
Pterandra sp.
Tetrapteris jussieuana

MALVACEAE

Sida acutifolia
cordifolia
macrodon

MARANTACEAE

Maranta arundinacea

MELASTOMATACEAE

Melastomataceae spp.6
Acisanthera sp.
Miconia argentea
Miconia sp.
Leandra sp.
Tibouchina sp.

MELIACEAE

Cabralea spp.
Guarea sp.
Trichilia sp.

MENISPERMACEAE

Menispermaceae spp.
Cissampelos ovalifolia
Cissampelos sp.

MORACEAE

Brosimum gaudichaudii
Cecropia sp.
Ficus sp.
Sorocea illicifolia

MYRISTICACEAE

Virola sebifera

MYRSINACEAE

Myrsine umbellata
Myrsine sp.

Rapanea guianensis

MYRTACEAE

Myrtaceae spp.
Campomanesia crenata
Campomanesia spp.
Eugenia bimarginata
klotzschiana
Eugenia spp.
Myrcia intermedia
longipes
rostrata
Psidium spp.5

NYCTAGINACEAE

Neea theifera
Pisonia sp.

OCHNACEAE

Ouratea castaneifolia
floribunda
nana
Ouratea sp.
Sauvagesia sp.

ONAGRACEAE

Ludwigia sp.

OPILIACEAE

Agonandra brasiliensis

ORCHIDACEAE

Orchidaceae spp.
Stenorhynchus coccineus
Vanilla sp.

OXALIDACEAE

Oxalis densifolia
hirsutissima

PALMAE

Palmae spp.15
Acanthococos emenensis
Acrocomia sclerocarpa
Acrocomia sp.
Allagoptera campestre
Attalea exigua
Butia sp.

Syagrus sp.

POLYGALACEAE

Bredmeyeria floribunda

Polygala angulata

Polygala sp.

POLYGONACEAE

Coccoloba sp.

PROTEACEAE

Roupala brasiliensis

montana

Roupala sp.

RHAMNACEAE

Crumenaria coluteoides

Rhamnidium elaeocarpm

RUBIACEAE

Alibertia edulis

obtusa

Alibertia sp.

Borreria capitata

latifolia

suaveolens

viburnoides

Borreria sp.

Oecleuxia sp.

Diodia rosmarinifolia

Genipa sp.

Guettarda angelica

Hemidiodia ocimifolia

Mitracarpus frigidus

Mitracarpus sp.

Palicourea rigida

xanthophylla

(aff. coriacea)

Palicourea spp.

Psychotria involucrata

Randia spp.

Relbunium sp.

Richardia scabra

Rudgia viburnoides

Sabicea cana

Sipanea spp.

Tocoyena formosa

RUTACEAE

Fagara sp.

Hortia brasiliiana

SAPINDACEAE

Cupania spp.

Dilodendron bipinnatum

Magonia pubescens

Matayba guianensis

Serjania erecta

grandiflora

SAPOTACEAE

Chrysophyllum soboliferum

Chrysophyllum sp.

Pouteria torta

SIMARUBACEAE

Simaba suffruticosa

Simaruba amara

SCROPHULARIACEAE

Buchnera virgata

SOLANACEAE

Solanum balbisii

lycocarpm

(aff. crinitum)

horridus

Solanum spp.

STERCULIACEAE

Byttneria oblongata

sagittifolia

Helicteres sacarolha

Helicteres sp.

Waltheria americana

communis

SYMPLOCACEAE

Symplocos nitens

STYRACACEAE

Styrax ferrugineum

TILIACEAE

Luehea speciosa

UMBELLIFERAE

Eryngium pristis

VERBENACEAE

Aegiphila lhotzkyana
*verticillata**Amasonia* sp.*Lantana lasiocarycina**Lantana* spp.*Lippia lupulina**Lippia* sp.*Stachytarpheta* sp.*Vitex* sp.

VOCHYSIACEAE

Qualea grandiflora
*multiflora**parviflora**Salvertia convallariodora**Vochysia elliptica**elongata**pruinosa**rufa**thyrsoidea**Vochysia* spp.6

NOTES ON NEW AND NOTEWORTHY PLANTS. LII

Harold N. Moldenke

HYMENOPYRAMIS PUBESCENS Moldenke, sp. nov.

Frutex scandens (?); ramulis tetragonis dense adpresso-puberulentibus; foliis oppositis; petiolis ca. 1 cm. longis densissime adpresso-pubescentibus; laminis obovato-ellipticis 7—11 cm. longis 3.5—7.5 cm. latis acutis integris ad basin juventute acutis maturitate truncatis, supra densissime puberulis, subtus densissime breviterque pubescentibus glanduliferis; utriculis ovatis usque ad 1.5 cm. longis 1 cm. latis ubique densissime puberulis.

Probably a climbing shrub; branches and branchlets obtusely tetragonal, the younger portions densely appressed-puberulent, the youngest parts more spreading-pubescent; leaves decussate-opposite; petioles about 1 cm. long, very densely appressed-pubescent; leaf-blades chartaceous, obovate-elliptic, 7—11 cm. long, 3.5—7.5 cm. wide, apparently acute at the apex, entire along the margins, acute at the base when immature but rounded-truncate when mature, very densely puberulent above (under a hand-lens), plainly and very densely short-pubescent with fulvous hairs beneath, more densely so on the larger venation; inflorescences axillary at the terminations of the branchlets, forming a leafy panicle, the branches diverging at right angles to the rachis, very densely appressed-pubescent with fulvous-cinereous hairs throughout; utricles membranous, ovate, apparently to 1.5 cm. long and 1 cm. wide, very densely puberulent throughout with yellowish hairs.

The type of this species was collected by Kai Larsen, T. Santisuk, and E. Warncke (no. 3409) at Nakhon Nayok, Sarika Falls, at an altitude of 300 meters, in central Thailand, on August 14, 1968, and is deposited in the herbarium of Aarhus Universitet, Aarhus, Denmark.